# Claims Rejections

## *Claims Rejection under 35 U.S.C. § 103*

The Examiner has rejected Claims 1-30 under 35 U.S.C. § 103(a) as being unpatentable over Taylor (U.S. Patent 5,789,323 issued to Thomas C. Taylor on 8/4/1998)

Per MPEP § 706.02(j), to support a prima facie case for an obviousness rejection under 35 U.S.C. § 103, the Examiner must establish four basic criteria:

- First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

- Second, there must be a reasonable expectation of success.

- Third, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

- The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicants' disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria.

These criterion will be examined individually.

## Suggestion/Motivation - Limitations – Taylor Does Not Disclose Structure/Method

## Claims 1-30 Rejection (Generally) – Structural Differences

To support a claims rejection under § 103, the Taylor reference **must disclose the structure** claimed by the Applicant. Claims rejections by the Examiner referencing the Taylor patent are improper because the capacitor structure disclosed by the Taylor patent is limited to common baseplate capacitor structures as indicated by Taylor's text:

> "**The equivalent circuit of the MFM capacitor structure of FIGS. 1A-E is shown in FIG. 2.** A first ferroelectric capacitor 29A has terminals 28A and 28C corresponding to the metal interconnect shown in FIG. 1E. A second ferroelectric capacitor 29B has terminals 28B and **shared terminal 28C also corresponding to the metal interconnect shown in FIG. 1E.**"

Here Taylor teaches away from any structure in which the bottom (baseplate) of the capacitor structure is **independent** of other capacitor structures on the substrate. This text makes reference to FIG. 2 reproduced below:

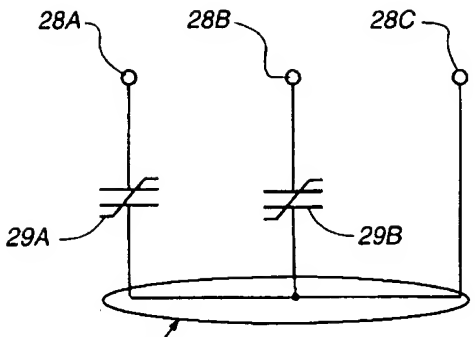



**Fig. 2**
**Prior Art**

This common baseplate configuration is a structural limitation on the disclosure of the Taylor patent, teaching away from the concept of integrating capacitors/inductors/interconnect in the manner taught by the Applicant. This fact is further emphasized by the PRIOR ART cited by Taylor (below)

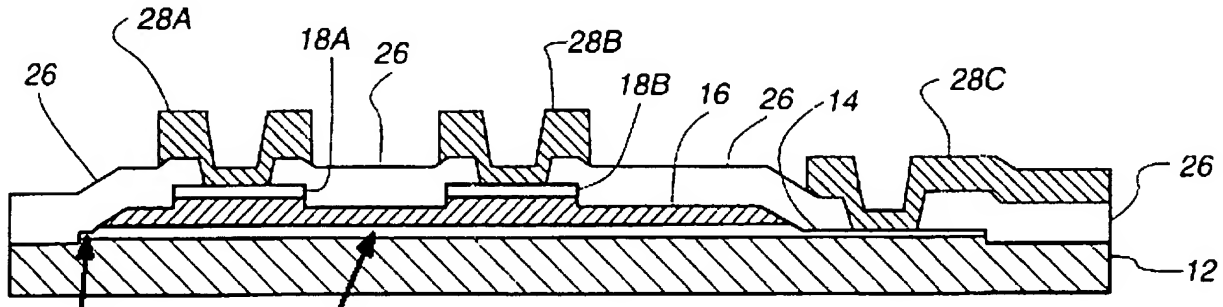



**Fig. 1E**
**Prior Art**

as well as the claimed Taylor capacitor structure (below):

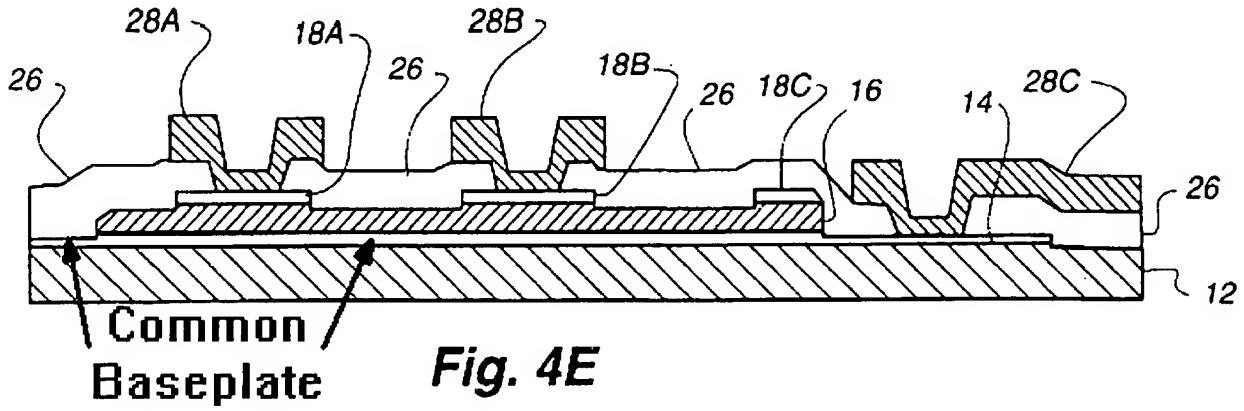



Fig. 4E

The Examiner has failed to recognize the limitation placed on the PRIOR ART as cited by Taylor that the structures disclosed by Taylor and the PRIOR ART limit the configuration to a SINGLE bottom electrode:

> "A prior art three-reticle MFM capacitor fabrication sequence 10 is shown in FIGS. 1A-E, for the fabrication of a ferroelectric capacitor structure illustratively having **two upper electrodes** (although any number can be used), **a [single] lower electrode,** and associated metal interconnect."

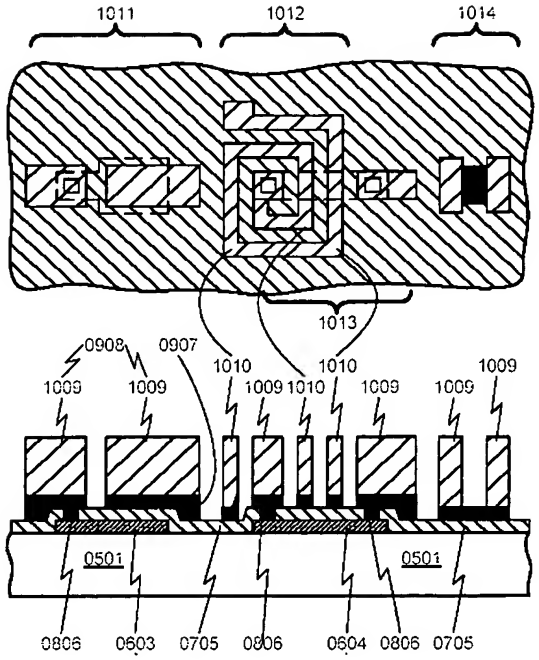
Taylor limits the scope of his own disclosure to configurations with a SINGLE lower electrode as indicated in exemplary Claim 1 of Taylor's patent:

> 1. A method of fabricating an MFM capacitor comprising the steps of:
>
> depositing on a substrate **a lower electrode layer,** a ferroelectric

> dielectric layer, and an upper electrode layer;
>
> etching the upper electrode layer and ferroelectric dielectric layer according to a first pattern, exposing an upper surface of **the lower electrode layer;** and
>
> etching the upper electrode layer and the lower electrode layer without etching through the ferroelectric dielectric layer according to a second pattern, **such that a portion of the exposed lower electrode remains.**

Here Taylor clearly limits the scope of his disclosure and that of the PRIOR ART to situations in which "a portion of the exposed lower electrode remains" wherein the capacitor structures are limited to situations where a common baseplate configuration is dictated. No suggestion is made within Taylor that the configuration can be modified to support independent capacitor baseplates or independent lower level interconnect.

In contrast, the Applicants' disclosure and claims permits independent capacitor baseplate and lower level interconnects that are not permitted or disclosed within the Taylor patent. As illustrated in FIG. 10 from the Applicants' disclosure:




This diagram illustrates that the Applicants' invention can permit fabrication of capacitors, inductors, and interconnects that are **independent** and which need not exibit the common capacitor baseplate connection illustrated in FIG. 2 (prior art) above. Note specifically the independence of lower capacitor plate 0603 and lower interconnect 0604. This independence is not possible with the teachings of the Taylor patent.

As such, the Taylor patent does not disclose the structure promoted by the Applicants' invention. Therefore, the Taylor patent cannot be used the basis for a § 103 rejection of Applicants' invention, as it imposes a structural limitation on fabrication not present in the Applicants' invention, and in no way teaches how this limitation can be overcome by any combination of prior art teachings. Only the Applicants' invention permits the use of independent capacitor baseplates and

other interconnects on the lower level of interconnect to permit combination of inductors, capacitors, and interconnect within a thin film hybrid substrate environment.

The Examiner is requested to note the preamble of Applicants' claims which read "A **thin film capacitor/inductor/interconnect** method …", indicating that the disclosed method is capable of multiple independent capacitor, inductor, and/or interconnects on the lower metalization level, a feature not possible with or suggested by the cited prior art.

### Claims 1-30 Rejection (Generally) – Silicon vs. Ceramic Substrate

Taylor's disclosure limits his discussion to "A method of fabricating a metal-ferroelectric-metal ("MFM") capacitor includes the steps of depositing a silicon dioxide layer on a silicon or other substrate…" but makes no suggestion as to how these principles may be applied to thin film technologies as applied to ceramic substrates. As stated in Applicants' disclosure

> "… processing thin film hybrid substrates offers unique challenges when compared to silicon wafers, and the teachings presented in this prior art are not directly applicable to thin film hybrid substrate processing."

It is notable that the Applicants' disclosure makes clear that

the substrates applicable to thin film technology do not include silicon, as disclosed by the Taylor disclosure:

> "Hybrid microelectronic devices are manufactured on a variety of substrate materials using various techniques such as thick film, low temperature co-fired ceramic (LTCC), specialty printed circuit board (PCB), or thin film technology."

Based on Applicants' disclosure, the citation of structures in which silicon is the sole disclosed substrate material is insufficient to support a § 103 rejection by the Examiner. Ceramic and silicon substrates have wildly differing electrical and physical properties, and the techniques applicable to fabricating microelectronic structures in one context are completely different than that of the other. Without some suggestion that the techniques disclosed by Taylor are applicable to ceramic substrates and thin film technology, the Taylor cannot form the basis of a § 103 claims rejection by the Examiner.

**Claims 1-30 Rejection (Generally) – Claim Dependency**

Claims 2-30 are dependent on Claim 1. Since the Applicants have successfully argued the allowability of Claim 1, dependent claims flowing from these allowable claims are patentable. As stated in MPEP § 608.01(n)(III):

> "Examiners are reminded that a dependent claim is directed to a combination including everything recited in the base claim and what is recited in the dependent claim. It is this combination that must be compared with the prior art, exactly as if it were presented as one independent claim."

Thus, the general arguments made for the allowability of Claim 1 are applicable to Claims 2-30 as they depend on an allowable independent base claim.

## Claim 1 Rejection

The Examiner has cited Taylor (Col. 1, lines 45-50) as reading on Applicants' Claim 1 as follows:

**1. A thin film capacitor/inductor/interconnect method comprising:**

**(1) thinly metalizing a substrate with a lower electrode and interconnect layer formed on said thin film hybrid substrate, said layer further comprising a lower adhesive layer and an upper conducting layer having a sum total thickness of less than or equal to 1.5 microns;**

The structure detailed by Taylor is different from this claim component in that it incorporates a "lead zirconate titanate (PZT) ferroelectric dielectric layer" and a thin upper

electrode. Taylor states in Col. 1, lines 45-54:

> "The sequence starts in FIG. 1A with a layer 12 of silicon dioxide (SiO.sub.2) about 5000 Angstroms thick on a silicon or other substrate (not shown in FIG. 1A). A lower electrode 14 consists of a layer of platinum (Pt) about 1750 Angstroms thick, and an adhesion layer of titanium (Ti) about 200 Angstroms thick that interfaces to silicon dioxide layer 12. **A lead zirconate titanate (PZT) ferroelectric dielectric layer** 16 is deposited on lower electrode 14 to a thickness of about 3000 Angstroms. An upper electrode 16 consists of a layer of platinum about 1750 Angstroms thick."

Taylor limits the scope of the prior art disclosure to thin metalization as applied to Metal-Ferroelectric-Metal (MFM) capacitor structures, limiting this scope in the first paragraph as follows:

> "This invention relates generally to metal-ferroelectric-metal ("MFM") capacitors, and, more particularly, to a fabrication method thereof involving two masking steps."

and fails to disclose any application towards Metal-Insulator-

Metal capacitor structures. No suggestion is made as to the applicability of the prior art cited in the Taylor patent to MIM capacitor structures, and no suggestion is made as to the applicability of the teachings of the Taylor invention as applied to the fabrication of MIM capacitors.

Taylor can only be used in a § 103 rejection if it suggests the use of the teachings in the context of a "thin film hybrid substrate system" as taught and claimed by the Applicants' invention. The Examiner is not permitted to substitute in Taylor's specification information not contained therein. Just because Taylor depicts layers of materials does not imply or provide a suggestion that the structure in his disclosure is applicable to other than what is stated in the Taylor specification.

Specifically, the context of the Taylor patent is that of MFM capacitor structures, not thin film hybrids. His use of a variety of insulating materials (not dielectrics) used in the MFM industry but not applicable to the thin film hybrid industry indicates that this reference cited by the Examiner does not by its very context contain structures indicated by the Applicants' invention disclosure.

The entire focus of the Taylor patent is to offer a two step patterning method for making MFM capacitors. In the background of the invention discussion, the patent discusses the need for a

two mask layer capacitor process as opposed to a three mask layer step process. It is not clear why Taylor feels the two step process is required over the three step process, only that "previous attempts to simplify the (three step) process..." have not been that successful (Col. 1, Paragraph 2).

The Examiner has stated that "Taylor fails to teach wherein the thickness of the first layer is 1.5 microns or less, nor does Taylor explicitly teach wherein the upper conducting layer is 0.25 microns thick as claimed by the Applicant. However, such thickness are considered an obvious variation because as Taylor teaches, thickness and composition of electrode materials can vary from those specified without substantially altering the invention (Col. 4, lines 60-68)." Note, however, that this citation by the Examiner makes reference to the DETAILED DESCRIPTION section of Taylor's specification, and does NOT relate or reference the PRIOR ART section which is relied on for the Examiner's rejection of Applicants' Claim 1. The full text of Taylor's generalization with respect to his invention follows:

> "Having described and illustrated the principles of the invention in a preferred embodiment thereof, it is appreciated by those having skill in the art that the invention can be modified in arrangement and detail without departing from such principles. For example, the thicknesses and

> composition of the electrode materials and ferroelectric dielectric films may vary from those specified herein without substantially altering the invention."

It is improper for the Examiner to apply a generalization present in and referencing Taylor's **DETAILED DESCRIPTION** of his INVENTION to that of Taylor's **PRIOR ART** description in his **BACKGROUND OF THE INVENTION.** If this generalization were proper as posited by the Examiner, then Taylor's own patent would have been obvious in light of the prior art he cited.

Finally, since the claimed structure present in the Applicants' invention is not disclosed in the Taylor reference (nor is there a suggestion as to how it might be accomplished with the prior art), Taylors listing of metalization thicknesses are inapplicable within the context of a § 103 rejection of the Applicants' invention, as Taylor must disclose both the structure and how to achieve same for a § 103 rejection to be valid.

## Claim 2 Rejection

The Examiner has cited Taylor (Col. 1, lines 49-50) as reading on Applicants' Claim 2 as follows:

2. **The thin film hybrid substrate method of Claim 1, wherein said lower adhesive layer is approximately 0.03 to 0.05 microns thick.**

Taylor mentions that the prior art as applied to MFM capacitor structures teaches the use of an adhesion layer of "about 200 Angstroms thick", but does nothing to teach this as applied to MIM capacitor structures. As stated previously, Taylor's generalization of structure thicknesses is stated as applying to his INVENTION, not the prior art. In any case, Taylor's claims **limit the scope of his disclosure** exclusively to MFM capacitors:

> "A method of fabricating an **MFM capacitor** comprising the steps of:
>
> depositing on a substrate a lower electrode layer, a **ferroelectric dielectric layer**, and an upper electrode layer;
>
> etching the upper electrode layer and **ferroelectric** dielectric layer according to a first pattern, exposing an upper surface of the lower electrode layer; and
>
> etching the upper electrode layer and the lower electrode layer without etching through the **ferroelectric** dielectric layer according to a second pattern, such that a portion of the

exposed lower electrode remains."

Given that the Applicants' disclosure and claims specifically to thin film MIM structures, Taylor's disclosure cannot be used as a basis for a § 103 rejection as the Taylor disclosure does not read on the technology area addressed by the Applicants' invention and there is no suggestion within the Taylor text to suggest that his teachings are applicable outside the fabrication of MFM capacitor structures.

## Claim 3 Rejection

The Examiner has cited Taylor (Abstract, lines 1-5) as reading on Applicants' Claim 3 as follows:

**3. The thin film hybrid substrate method of Claim 1, wherein said lower adhesive layer comprises chrome.**

Taylor mentions in the Abstract the use of "noble metal electrode" as follows:

> "A method of fabricating a metal-ferroelectric-metal ("MFM") capacitor includes the steps of depositing a silicon dioxide layer on a silicon or other substrate, a lower platinum or other **noble metal** electrode, a PZT or other ferroelectric material dielectric layer, and an upper platinum or other **noble metal** electrode."

The noble metals comprise copper (Cu), silver (Ag), gold (Au), platinum (Pt), palladium (Pd), and sometimes irridium (Ir). Chrome is **not** a noble metal, and therefore there is nothing within the Taylor specification, claims, or abstract which reads on the Applicants' invention or claims.

## Claim 4 Rejection

The Examiner has cited Taylor (Col. 1, lines 49-50) as reading on Applicants' Claim 4 as follows:

**4. The thin film hybrid substrate method of Claim 1, wherein said lower adhesive layer comprises titanium.**

The Taylor patent limits the scope of the text cited to a "three-reticle MFM **[metal-ferroelectric-metal]** capacitor fabrication sequence" and makes **no suggestion** that this process is in any way applicable to fabrication of capacitor/inductor/interconnects as applied to MIM (metal-insulator-metal) thin film hybrids. As such, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the Taylor reference or to combine reference teachings to apply these outside the scope of MFM capacitor fabrication.

Additionally, the prior art cited in Taylor does not teach all of the claims limitations present in Applicants' invention.

Specifically, Applicants' invention teaches that the incorporation of **capacitor/inductor/interconnects** using the lower conducting layer as an interconnect mechanism. This is not taught by the art cited in the Taylor patent. This distinction can be viewed visually by comparing the following Taylor prior art:

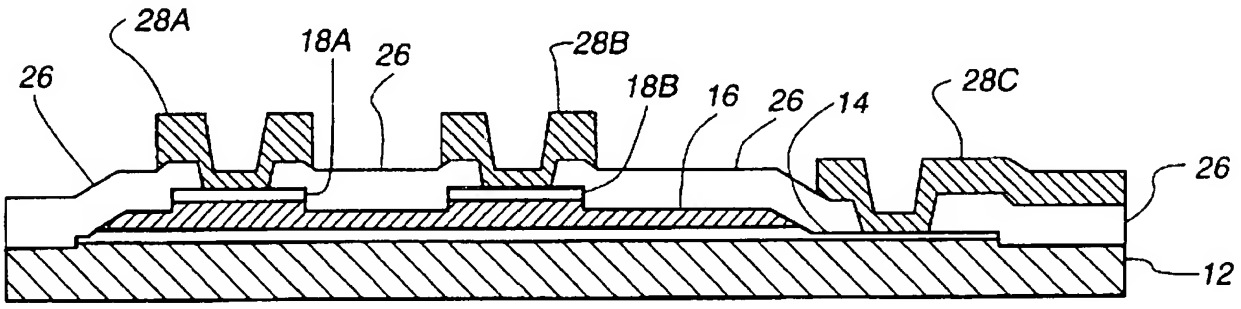
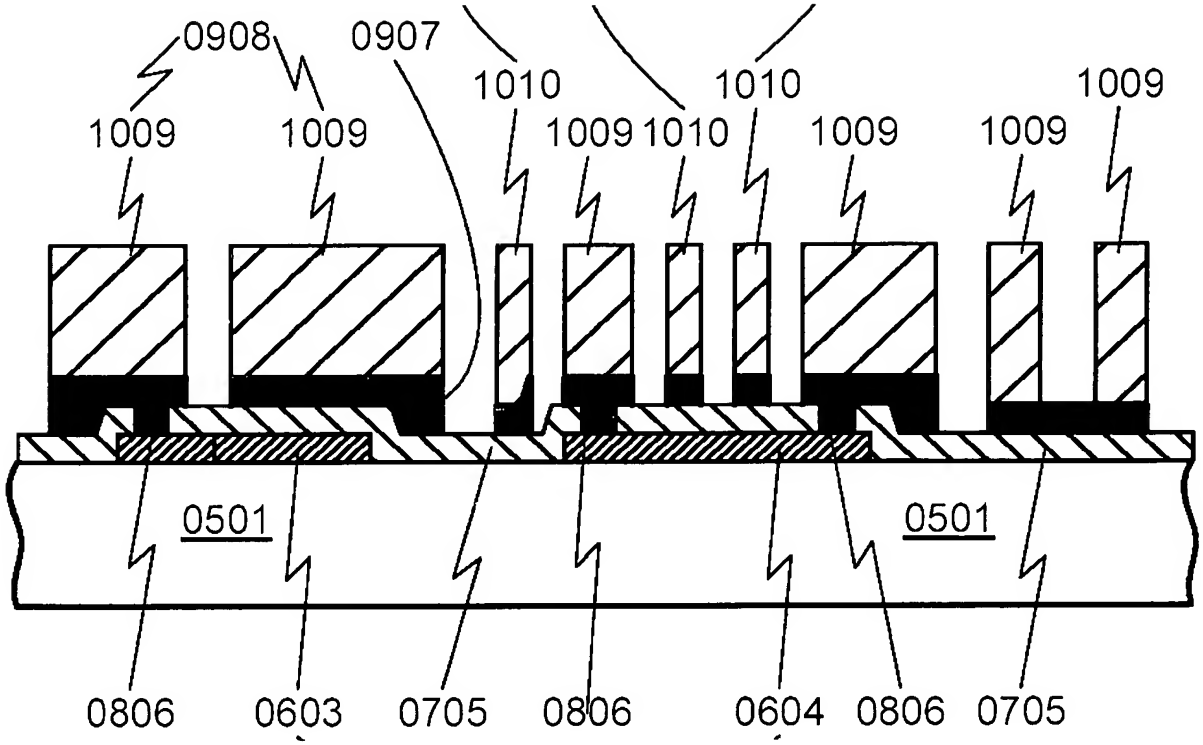



***Fig. 1E***
***Prior Art***

with that of Applicants' invention:




Here it is clear that the Applicants teach a method wherein the lower conducting layer can be used to provide support for capacitors, inductors, and interconnect (note construction of **14** in the prior art as compared to (**0603, 0604**) in Applicants' invention). This feature is not taught by any reference cited by Taylor, nor is there any suggestion that this should be possible using the teachings of the prior art.

## Claim 5 Rejection

The Examiner has cited Taylor (Col. 1, lines 49-50) as reading on Applicants' Claim 5 as follows:

**5. The thin film hybrid substrate method of Claim 1, wherein said lower adhesive layer comprises titanium-tungsten.**

Arguments made with respect to Claim 4 are equally applicable to this claim rejection by the Examiner.

Additionally, the Taylor patent cannot be used as the basis for a § 103 rejection for Claim 5 because the phrase "titanium-tungsten" is nowhere mentioned within the Taylor patent. Given that the Taylor patent does not teach or suggest the use or limitation of titanium-tungsten within the lower adhesive layer, the citation of Taylor by the Examiner for § 103 purposes is improper.

## Claim 6 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 6 as follows:

6. **The thin film hybrid substrate method of Claim 1, wherein said upper conducting layer comprises silver.**

The cited text by the Examiner is as follows:

> "A method of fabricating a metal-ferroelectric-metal ("MFM") capacitor includes the steps of depositing a silicon dioxide layer on a silicon or other substrate, a lower platinum or other noble metal electrode, **a PZT or other ferroelectric material dielectric layer**, and an upper platinum or other noble metal electrode."

The Taylor application teaches the use of "a PZT or other ferroelectric material dielectric layer" which is not applicable to the fabrication of thin film hybrid technology MIM capacitor / inductor / interconnects.

## Claim 7 Rejection

The Examiner has cited Taylor (Col. 2, lines 10-15) as reading on Applicants' Claim 7 as follows:

7. **The thin film hybrid substrate method of Claim 1, wherein said upper conducting layer comprises aluminum.**

The citation in the Taylor patent states:

> "Metal layer **28** can be formed of any number of materials including aluminum and gold."

However, "metal layer 28" as illustrated in the PRIOR ART cited by Taylor

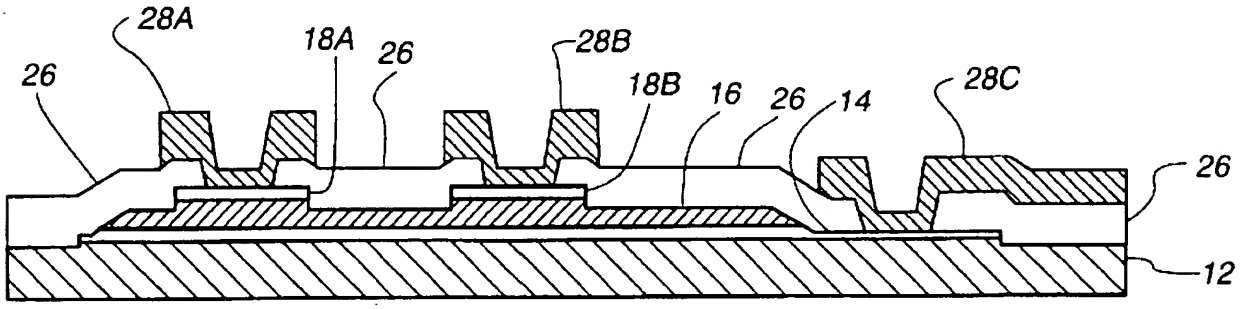
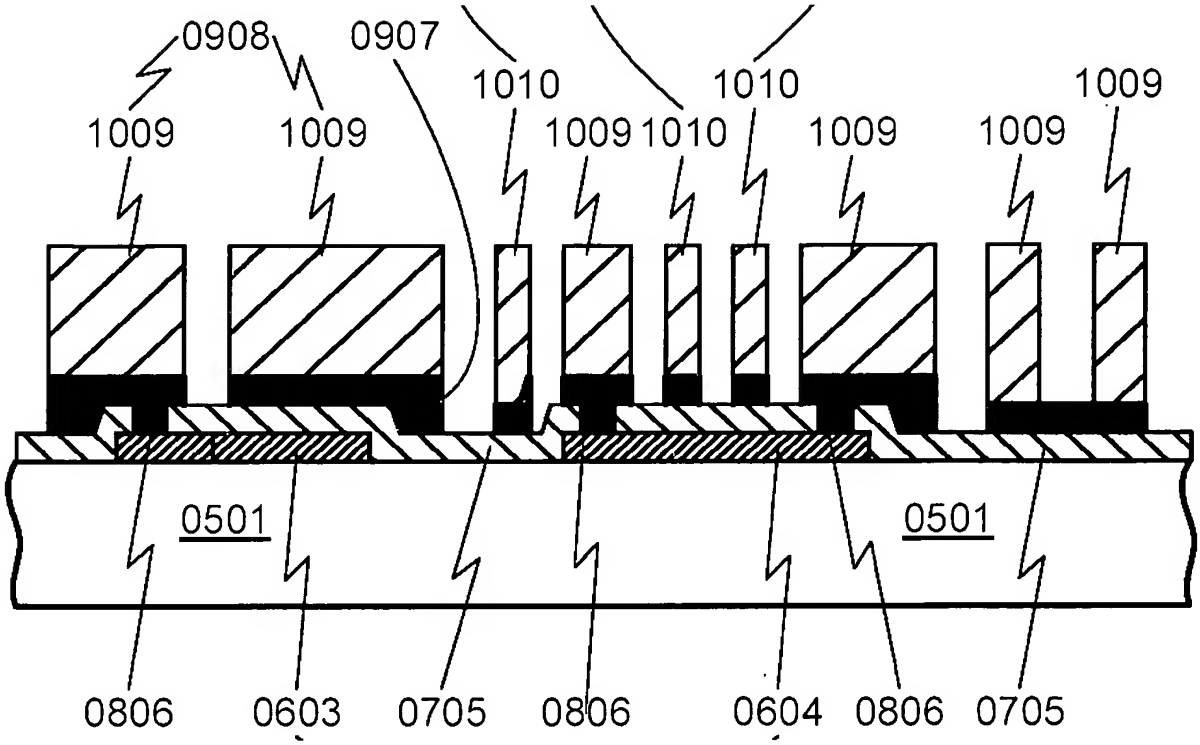



***Fig. 1E***
***Prior Art***

does not correspond to "said upper conducting layer" (**0603, 0604**) detailed in the Applicants' invention:




The Examiner may be confused on this point given that the Applicants have referred to the base plate of the capacitor/inductor/interconnect (**0603**, **0604**, and **0502** collectively) as "typically formed of a **lower adhesive layer** and an **upper conducting layer**." Thus, the metal layer 28 and the "upper conducting layer" referenced in Applicants' claim refer to two different structural entities and therefore Taylor's reference cannot be used as the basis for a § 103 rejection of Applicants' Claim 7.

## Claim 8 Rejection

The Examiner has cited Taylor (Col. 2, lines 10-15) as reading on Applicants' Claim 8 as follows:

**8. The thin film hybrid substrate method of Claim 1, wherein said upper conducting layer comprises gold.**

Arguments made with respect to Claim 7 are equally applicable to this claim rejection by the Examiner. Item 28 as cited by Taylor does not correspond to the "upper conducting layer" claimed by Applicant, and therefore the Taylor patent cannot be used as the basis for a § 103 rejection of Applicants' Claim 8.

## Claim 9 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 9 as follows:

**9. The thin film hybrid substrate method of Claim 1, wherein said upper conducting layer comprises copper.**

Arguments made with respect to Claim 3 are equally applicable to this claim rejection by the Examiner.

Additionally, the Taylor patent cannot be used as the basis for a § 103 rejection for Claim 5 because the phrase "copper" is nowhere mentioned within the Taylor patent. Given that the Taylor patent does not teach or suggest the use or limitation of copper within the upper conducting layer, the citation of Taylor by the Examiner for § 103 purposes is improper.

## Claim 10 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 10 as follows:

**10. The thin film hybrid substrate method of Claim 1, wherein said lower electrode and interconnect layer further comprises silver.**

Taylor does not teach the use of a "lower electrode and interconnect layer" as taught by the Applicant. Taylor's Abstract limits the scope of the disclosed invention to "metal-ferroelectric-metal ("MFM") capacitors" and makes no mention of how such structures can be modified to achieve "lower electrode" or "lower … interconnect" layers as taught by the Applicant. The Examiner is requested to examine arguments made in Claim 4 above, specifically the difference between Taylor's item 14 and Applicants' item (**0603**) and (**0604**). Taylor's FIG. 4E also incorporates these limitations on the lack of a lower electrode and interconnect layer as taught by the Applicant:

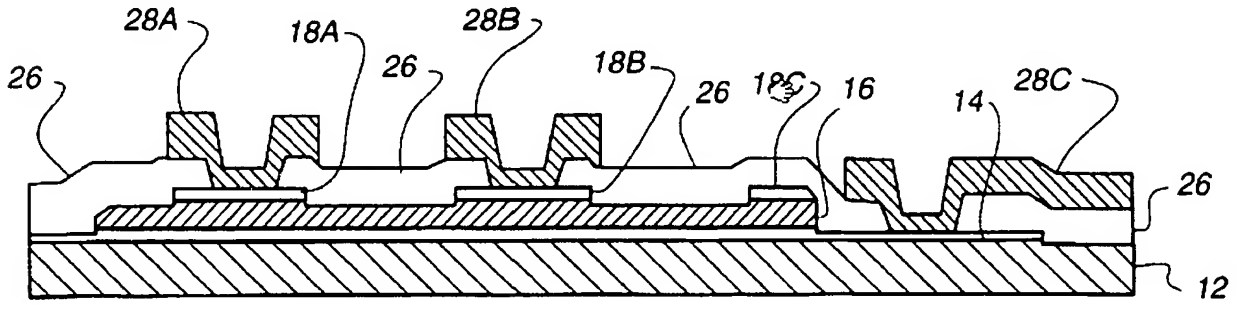



***Fig. 4E***

Given that the Taylor reference does not teach or suggest all the claim limitations of Applicants' invention, the use of the Taylor patent for the purposes of a § 103 rejection is improper.

## Claim 11 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-15) as reading on Applicants' Claim 11 as follows:

**11. The thin film hybrid substrate method of Claim 1, wherein said lower electrode and interconnect layer further comprises aluminum.**

Arguments made with respect to Claim 7 are equally applicable to this claim rejection by the Examiner. Item 28 as cited by Taylor does not correspond to the "lower electrode and interconnect layer" claimed by Applicant, and therefore the Taylor patent cannot be used as the basis for a § 103 rejection of Applicants' Claim 11.

## Claim 12 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-15) as reading on Applicants' Claim 12 as follows:

**12. The thin film hybrid substrate method of Claim 1, wherein said lower electrode and interconnect layer further comprises gold.**

Arguments made with respect to Claim 7 are equally applicable to this claim rejection by the Examiner. Item 28 as cited by Taylor does not correspond to the "lower electrode and interconnect layer" claimed by Applicant, and therefore the Taylor patent cannot be used as the basis for a § 103 rejection of Applicants' Claim 12.

## Claim 13 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 13 as follows:

13. **The thin film hybrid substrate method of Claim 1, wherein said lower electrode and interconnect layer further comprises copper.**

Arguments made with respect to Claim 10 are equally applicable to this claim rejection by the Examiner. Since Taylor does not teach the use of a "lower electrode and interconnect layer", the Taylor patent cannot serve as the basis of a § 103 rejection of Applicants' Claim 13.

## Claim 14 Rejection

The Examiner has cited Taylor (Col. 1, lines 45-50) as reading on Applicants' Claim 14 as follows:

**14. The thin film hybrid substrate method of Claim 1, wherein said lower electrode and interconnect layer is selected from the group consisting of tantalum, tungsten, titanium, nickel, molybdenum, platinum, palladium, and chromium.**

The Examiner's reference cites the following PRIOR ART text in the Taylor patent:

> "A prior art **three-reticle MFM capacitor fabrication sequence** 10 is shown in FIGS. 1A-E, for the fabrication of a **ferroelectric capacitor** structure illustratively having two upper electrodes (although any number can be used), **a lower electrode**, and associated metal interconnect. The sequence starts in FIG. 1A with a layer 12 of silicon dioxide (SiO.sub.2) about 5000 Angstroms thick on a silicon or other substrate (not shown in FIG. 1A). A lower electrode 14 consists of a layer of platinum (Pt) about 1750 Angstroms thick, and an adhesion layer of titanium (Ti) about 200 Angstroms thick that interfaces to silicon dioxide layer 12."

Taylor does not teach the use of a "lower electrode and interconnect layer" as taught by the Applicant. Taylor's Abstract limits the scope of the disclosed invention to "metal-

ferroelectric-metal ("MFM") capacitors" and makes no mention of how such structures can be modified to achieve "lower electrode" or "lower … interconnect" layers as taught by the Applicant. The Examiner is requested to examine arguments made in Claim 4 above, specifically the difference between Taylor's item 14 and Applicants' item (**0603**) and (**0604**). Taylor's FIG. 4E also incorporates these limitations on the lack of a lower electrode and interconnect layer as taught by the Applicant:

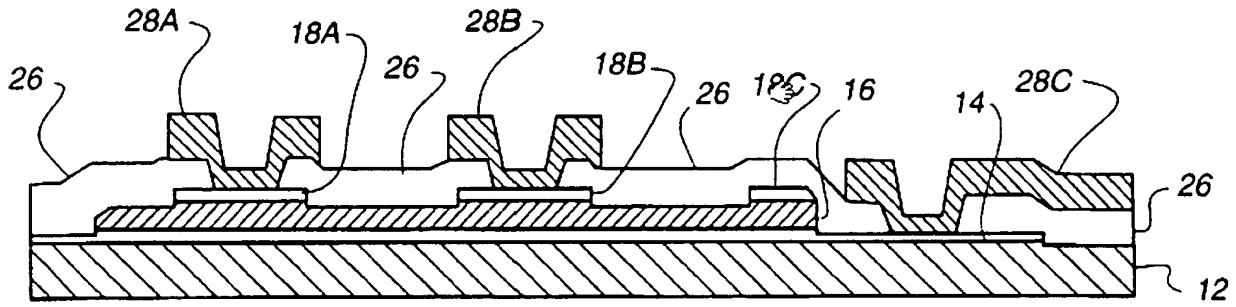



***Fig. 4E***

Given that the Taylor reference does not teach or suggest all the claim limitations of Applicants' invention, the use of the Taylor patent for the purposes of a § 103 rejection is improper.

Additionally, the mere mention of "titanium" within the Taylor PRIOR ART description does not imply that the use of "**tantalum, tungsten, titanium, nickel, molybdenum, platinum, palladium, and chromium**" as taught by the Applicants for use in a "**lower electrode and interconnect layer**", especially when no such "lower electrode and interconnect layer" is not taught by the

Taylor patent.

### Claim 15 Rejection

The Examiner has cited Taylor (Col. 1, lines 58-63) as reading on Applicants' Claim 15 as follows:

**15. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer is selectively patterned.**

Selective patterning of the dielectric layer, while taught by the PRIOR ART in Taylor, is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Given that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

### Claim 16 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 16 as follows:

**16. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises silicon nitride.**

The Taylor reference makes no reference to the use of "silicon nitride" in any of its forms as the basis for a dielectric layer, and there is no suggestion within this reference that such a substitution would be useful or effective.

The mere mention of a "silicon dioxide layer" within the abstract of the Taylor reference is insufficient to warrant the Examiner's § 103 rejection given that one skilled in the art would not be led to make this substitution given the disclosure of the Taylor patent. As such, the Examiner's § 103 rejection is improper as it is not in any way supported by the Taylor disclosure. Given that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 17 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 17 as follows:

**17. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises silicon dioxide.**

A silicon dioxide dielectric layer, while taught by the PRIOR ART in Taylor, is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Given that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 18 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 18 as follows:

**18. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises silicon oxynitride.**

The Taylor reference makes no reference to the use of "silicon oxynitride" in any of its forms as the basis for a dielectric layer, and there is no suggestion within this reference that such a substitution would be useful or effective. The mere mention of a "silicon dioxide layer" within the abstract of the Taylor reference is insufficient to warrant the Examiner's § 103 rejection given that one skilled in the art would not be led to make this substitution given the disclosure of the Taylor patent. As such, the Examiner's § 103 rejection is improper as it is not in any way supported by the Taylor disclosure.

## Claim 19 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 19 as follows:

**19. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises aluminum oxide.**

The Taylor reference makes no reference to the use of "aluminum oxide" in any of its forms as the basis for a

dielectric layer, and there is no suggestion within this reference that such a substitution would be useful or effective. The mere mention of a "silicon dioxide layer" within the abstract of the Taylor reference is insufficient to warrant the Examiner's § 103 rejection given that one skilled in the art would not be led to make this substitution given the disclosure of the Taylor patent. As such, the Examiner's § 103 rejection is improper as it is not in any way supported by the Taylor disclosure.

## Claim 20 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 20 as follows:

**20. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises tantalum pentoxide.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a tantalum pentoxide dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP

§ 608.01(n)(III).

## Claim 21 Rejection

The Examiner has cited Taylor (Abstract, lines 1-10) as reading on Applicants' Claim 21 as follows:

**21. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises a ferroelectric material.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a ferroelectric dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 22 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 22 as follows:

**22. The thin film hybrid substrate method of Claim 21, wherein said ferroelectric material is $BaTiO_3$.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a $BaTiO_3$ dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 23 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 23 as follows:

**23. The thin film hybrid substrate method of Claim 21, wherein said ferroelectric material is $SrTiO_3$.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a $SrTiO_3$

dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 24 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 24 as follows:

**24. The thin film hybrid substrate method of Claim 21, wherein said ferroelectric material is $PbZrO_3$.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a $PbZrO_3$ dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 25 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 25 as follows:

**25. The thin film hybrid substrate method of Claim 25, wherein said ferroelectric material is $PbTiO_3$.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a $PbTiO_3$ dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 26 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 26 as follows:

**26. The thin film hybrid substrate method of Claim 21, wherein said ferroelectric material is $LiNbO_3$.**

Taylor teaches the use of a ferroelectric dielectric layer,

but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a $LiNbO_3$ dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

### Claim 27 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 27 as follows:

**27. The thin film hybrid substrate method of Claim 21, wherein said ferroelectric material is $Bi_{14}Ti_3O_{12}$.**

Taylor teaches the use of a ferroelectric dielectric layer, but this teaching is not taught within the context of independent capacitor baseplates and lower level interconnects as taught by Applicants' invention. Furthermore, the Examiner has provided no documentation to support the argument that the use of a $Bi_{14}Ti_3O_{12}$ dielectric in this context would be obvious to one of ordinary skill in the art in this thin film fabrication context. For this reason and given as previously shown that Claim 1 reads on a

structure not taught by the prior art, this dependent claim is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

## Claim 28 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 28 as follows:

**28. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises polyimide.**

Applicants first state in response to Examiner's rejection that since the Base Claim (Claim 1) has been shown to be allowable, the dependent claim which follows is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

Furthermore, Taylor neither discloses nor suggests the use of a polyimide dielectric layer in his disclosure. Without the suggestion of the use of a polyimide dielectric layer by Taylor, use of the Taylor reference by the Examiner as the basis of a § 103 rejection is improper. The Examiner has provided no documentation to support the assertion that a polyimide dielectric layer would be obvious based on any prior art citation.

## Claim 29 Rejection

The Examiner has cited Taylor (Col. 1, lines 10-20) as reading on Applicants' Claim 29 as follows:

**29. The thin film hybrid substrate method of Claim 1, wherein said dielectric layer further comprises benzocyclobutene.**

Applicants first state in response to Examiner's rejection that since the Base Claim (Claim 1) has been shown to be allowable, the dependent claim which follows is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

Furthermore, Taylor neither discloses nor suggests the use of a benzocyclobutene dielectric layer in his disclosure. Without the suggestion of the use of a benzocyclobutene dielectric layer by Taylor, use of the Taylor reference by the Examiner as the basis of a § 103 rejection is improper. The Examiner has provided no documentation to support the assertion that a benzocyclobutene dielectric layer would be obvious based on any prior art citation.

## Claim 30 Rejection

The Examiner has cited Taylor (Col. 1, lines 45-50) as reading on Applicants' Claim 30 as follows:

**30. The thin film hybrid substrate method of Claim 1, wherein said substrate material is selected from the group consisting of alumina, beryllium oxide, fused silica, aluminum nitride, sapphire, ferrite, diamond, LTCC, and glass.**

Applicants first state in response to Examiner's rejection that since the Base Claim (Claim 1) has been shown to be allowable, the dependent claim which follows is therefore allowable. Rejection is therefore improper per MPEP § 608.01(n)(III).

Furthermore, Taylor neither discloses nor suggests the use of any of Applicants' claimed substrate materials in his disclosure. Without the suggestion of the use of a these substrate layers by Taylor, use of the Taylor reference by the Examiner as the basis of a § 103 rejection is improper. The Examiner has provided no documentation to support the assertion that the cited substrate layers would be obvious based on any prior art citation. The mere recitation of "other substrate" by Taylor is insufficient to support the assertion that the materials cited by the Applicants are disclosed or suggested by the Taylor reference.

## Reasonable Expectation of Success

The Examiner has not cited any support for a reasonable

expectation of success in generating the claimed assembly of the Applicants' invention by combining elements of the prior art.

Without some **expectation of success**, the use of Taylor's structure, even with substitutions suggested by the Examiner, fails a prima facie case of obviousness. The mere fact that Taylor may utilize some of the components of the Applicants' invention does not imply the full structure of the Applicants' claimed invention. Additionally, Taylor does not suggest any possible variation that would suggest that any combination would be successful in solving the step coverage problem **in MIM capacitors** as detailed and addressed by the Applicants' invention disclosure. Finally, Taylor does not disclose or suggest any structure capable of implementing capacitor/inductor/interconnects as disclosed by the Applicants, and fails to support any construction that supports independent capacitor baseplates as does the Applicants' invention disclosure.

## Claimed Limitations

Furthermore, structural limitations in Taylor preclude its use as a § 103 rejection because it requires limiting capacitor structures to a **single lower electrode**, as indicated in Claims 8-10:

8. A method of fabricating an MFM capacitor comprising the steps of:

depositing an oxide layer on a substrate;

depositing a platinum lower electrode layer on the oxide layer;

depositing a PZT ferroelectric dielectric layer on the lower electrode layer;

depositing a platinum upper electrode layer on the ferroelectric dielectric layer;

etching the upper electrode layer and the ferroelectric layer according to a pattern determined by a first reticle, exposing an upper surface of the lower electrode layer;

etching the upper electrode layer and the lower electrode layer without etching through the ferroelectric dielectric layer according to a pattern determined by a second reticle, so that **one or more upper electrodes**, a vestigial upper electrode, and **a bottom electrode** having an exposed upper surface are formed.

9. The method of claim 8 further comprising the steps of:

depositing an oxide dielectric layer on

the surface of the MFM capacitor; and

etching the oxide dielectric layer to expose the surface of the **upper electrodes** and **bottom electrode,**

wherein the vestigial upper electrode is electrically isolated.

10. The method of claim 9 further comprising the step of individually metalizing the **upper electrodes** and **bottom electrode.**

The Applicants' invention includes no such limitation or requirement, and permits independent capacitor baseplate electrodes as well as lower level interconnects.

The Examiner may not use hindsight reasoning for the basis of a § 103 rejection. To fully support a § 103 rejection on these grounds, the Examiner must cite a reference which suggests the use of the structure cited by the Applicants in this particular context and in addition, these suggestions must include information relating to the overall thickness of the metals as indicated in the Applicants' invention disclosure as well as the application of these metals and dielectrics to the problem of MIM capacitor/inductor/interconnect step coverage manufacturability.

## ***Non-Obviousness Based on Customer Testimonial***

The Applicants have submitted the present invention for inspection to customers knowledgeable in the industry and have received a testemonial (reprinted on the following page) from Bill Coughlin of the the Information and Electronic Warfare Systems division of BAE SYSTEMS NORTH AMERICA. This document indicates that the customer base for this product concludes that the present invention provides a "process approach … unique to the industry" and "offer[s] a new and unique competitive solution to other multilayer thin film techniques such as 'air bridges' or 'polyimide supported air bridges'. This customer statement rebuts the Examiner's argument of obviousness under § 103.

This documentation supports the Applicants' assertion that the claimed structure is not obvious to one skilled in the art and as such may not be the subject of a § 103 rejection as posited by the Examiner.